

CLAIMS

1. A firing furnace comprising a combusting means for
combusting a fuel containing methane flown therein for
5 generating a combustion gas, and a firing furnace main body for
heating and firing a member to be fired, that has been conveyed
into the inside thereof, by a combustion gas and exhausting the
combustion gas after firing the member to the outside,

wherein a methane reforming device filled with a methane
10 reforming catalyst in the inside thereof, for producing a
reformed gas containing hydrogen and carbon dioxide by
contacting a reforming material composed of a methane sub fuel
for reformation having methane flown therein as a major
component and steam with the methane reforming catalyst while
15 heating the material by the combustion gas so as to make methane
in the reforming material react with steam, is further provided.

2. The firing furnace according to claim 1, wherein the
methane reforming device is provided in the firing furnace main
body for contacting the reforming material with the methane
20 reforming catalyst while heating the material by the combustion
gas so as to produce a reformed gas.

3. The firing furnace according to claim 1, wherein the
methane reforming device is provided outside the firing furnace
main body for contacting the reforming material with the methane
25 reforming catalyst while heating the material by the combustion
gas exhausted to the outside of the firing furnace main body
so as to produce the reformed gas.

4. The firing furnace according to claim 1, further comprising a fuel cell for generating electricity by the reaction of hydrogen and oxygen or air, wherein a part or the entirety of hydrogen contained in the reformed gas is used for
5 reaction with oxygen or air in the fuel cell as hydrogen for the fuel cell.

5. The firing furnace according to claim 1, further comprising a hydrogen separating device for separating the reformed gas produced in the methane reforming device by flowing
10 the reformed gas into the inside thereof for selectively separating hydrogen in the reformed gas into a hydrogen fuel containing hydrogen as a major component and a residual gas containing carbon dioxide.

6. The firing furnace according to claim 5, wherein a part
15 or the entirety of the hydrogen fuel is used for reaction with oxygen or air in the fuel cell as hydrogen for the fuel cell.

7. The firing furnace according to claim 5, wherein a part or the entirety of hydrogen fuel is mixed with a methane main fuel for mixture containing methane as a major component so as
20 to provide a fuel mixture, and combusting the fuel mixture in the combusting means.

8. The firing furnace according to claim 5, wherein a part of hydrogen fuel is used for reaction with oxygen or air in the fuel cell as hydrogen for the fuel cell, remainder part is mixed
25 with a methane main fuel for mixture containing methane as a major component so as to provide a fuel mixture, and combusting the fuel mixture in the combusting means.

9. The firing furnace according to claim 7, wherein the volume ratio of the methane sub fuel for reformation and the methane main fuel for mixture (methane sub fuel for reformation : methane main fuel for mixture) is 5:95 to 100:0.

5 10. The firing furnace according to claim 8, wherein the volume ratio of the methane sub fuel for reformation and the methane main fuel for mixture (methane sub fuel for reformation : methane main fuel for mixture) is 5:95 to 100:0.

11. The firing furnace according to claim 5, wherein the
10 residual gas exhausted from the hydrogen separating device is combusted by firing means.

12. The firing furnace according to claim 5, further comprising a carbon dioxide fixing device for fixing carbon dioxide in the residual gas separated by the hydrogen separating
15 device not so as to discharge it in a gas state to the outside thereof.

13. The firing furnace according to claim 12, wherein the carbon dioxide fixing device contains sodium hydroxide as a fixing agent for fixing carbon dioxide so as to produce sodium
20 carbonate by making sodium hydroxide react with carbon dioxide.

14. The firing furnace according to claim 1, wherein the firing furnace main body is a firing furnace main body of continuous type for conveying a member to be fired continuously into the inside thereof and conveying the member continuously
25 to the outside after heating the member to be fired in the inside thereof.

15. The firing furnace according to claim 1, wherein at least

one of the methane sub fuel for reformation and the methane main fuel for mixture is a liquefied natural gas (LNG).

16. The firing furnace according to claim 1, wherein the material of the member to be fired is a ceramic.

5 17. The firing furnace according to claim 1, wherein the member to be fired has a honeycomb structure.

18. A firing method comprising the steps of
generating a combustion gas by flowing a fuel containing methane into a combustng means and combustng,

10 introducing the combustion gas generated in the combustng means into the inside of a firing furnace main body,
heating and firing a member to be fired conveyed into the inside by the combustion gas, and

exhausting the combustion gas after firing to the outside
15 of the firing furnace main body,

wherein a reforming material composed of a methane sub fuel for reformation having methane flown therein as a major component and steam is flown into a methane reforming device filled with a methane reforming catalyst in the inside thereof,
20 and

wherein the reforming material is contacted with the methane reforming catalyst while heating the material by combustion gas so as to make methane in the reforming material react with steam for producing a reformed gas containing
25 hydrogen and carbon dioxide.

19. The firing method according to claim 18, wherein the methane reforming device is provided inside the firing furnace

main body for contacting the reforming material with the methane reforming catalyst while heating the material by the combustion gas so as to produce a reformed gas.

20. The firing method according to claim 18, wherein the
5 methane reforming device is provided outside the firing furnace main body for contacting the reforming material with the methane reforming catalyst while heating the material by the combustion gas exhausted to the outside of the firing furnace main body so as to produce a reformed gas.

10 21. The firing method according to claim 19, wherein the methane reforming device is provided outside the firing furnace main body for contacting the reforming material with the methane reforming catalyst while heating the material by the combustion gas exhausted to the outside of the firing furnace main body
15 so as to produce a reformed gas.

22. The firing method according to claim 18, wherein a part or the entirety of hydrogen contained in the reformed gas reacts with oxygen or air in the fuel cell as hydrogen for the fuel cell for the power generation.

20 23. The firing method according to claim 18, wherein the reformed gas produced in the methane reforming device is flown into the inside of a hydrogen separating device for selectively separating hydrogen in the reformed gas into hydrogen fuel containing hydrogen as a major component and a residual gas
25 containing carbon dioxide.

24. The firing method according to claim 23, wherein a part or the entirety of hydrogen fuel is used for reaction with oxygen

or air in the fuel cell as hydrogen for the fuel cell.

25. The firing method according to claim 23, wherein a part or the entirety of hydrogen fuel is mixed with a methane main fuel for mixture containing methane as a major component so as to provide a fuel mixture, and combusting the fuel mixture in
5 combusting means.

26. The firing method according to claim 23, wherein a part of hydrogen fuel is used for reaction with oxygen or air in the fuel cell, remainder part is mixed with a methane main fuel for
10 mixture containing methane as a major component so as to provide a fuel mixture, and combusting the fuel mixture in the combusting means.

27. The firing method according to claim 25, wherein the methane sub fuel for reformation and the methane main fuel for
15 mixture are used with the volume ratio (methane sub fuel for reformation : methane main fuel for mixture) of 5:95 to 100:0.

28. The firing method according to claim 26, wherein the methane sub fuel for reformation and the methane main fuel for
20 mixture are used with the volume ratio (methane sub fuel for reformation : methane main fuel for mixture) of 5:95 to 100:0.

29. The firing method according to claim 23, wherein the residual gas exhausted from the hydrogen separating device is combusted in the firing means.

30. The firing method according to claim 23, wherein the
25 residual gas separated in the hydrogen separating device is flown into a carbon dioxide fixing device for fixing carbon dioxide in the residual gas not so as to discharge it in a gas

state to the outside thereof.

31. The firing method according to claim 30, wherein the carbon dioxide fixing device contains sodium hydroxide as a fixing agent for fixing carbon dioxide so as to produce sodium carbonate by making sodium hydroxide react with carbon dioxide.

32. The firing method according to claim 18, wherein a firing furnace main body of continuous type for conveying the member to be fired continuously into the inside and conveying the member continuously to the outside after heating the member to be fired in the inside is used as the firing furnace main body.

33. The firing method according to claim 18, wherein a liquefied natural gas (LNG) is used as at least one of the methane sub fuel for reformation and the methane main fuel for mixture.

34. The firing method according to claim 18, wherein a ceramic is used as the material of the member to be fired.

35. The firing method according to claim 18, wherein a honeycomb structure is used as the member to be fired.